Passive, active, benchmarks and bonds

Portfolio Construction

1 A story: the bus, the bicycle, the racing car

- Passive: buy the whole market cheaply and hold it
- Factor-based: written rules that lean toward a trait
- Active: pay a manager to try to beat the market
- Where on the range should the trustees sit?

IN THE LESSON

- Think about getting to work.
- You can take the bus, which is cheap and slow and goes where everyone else goes.
- You can ride a bicycle, which gives you a little more control.
- Or you can hire a racing driver, which is brilliant if the driver is good and very expensive if not.
- Equity management is the same.
- At one end is passive: the fund buys the whole market through an index fund and holds it.
- In the middle sit factor based funds, also called smart beta, which follow written rules to lean toward rewarded traits.
- At the other end is full active management, where a manager picks shares to beat the market.
- Where should the trustees sit?

2 The range from passive to highly active

- Index fund
- Smart beta
- Active
- Concentrated

IN THE LESSON

- Here is the range as a line.
- On the left is passive, on the right is highly active.
- The index fund is at the far left.
- It owns every share in the market at its market weight, and it hardly trades.
- Next comes smart beta.
- It follows published rules to tilt toward a factor such as value or momentum, at a fee well below a full active fund.
- Then comes ordinary active management, where a manager chooses holdings but stays fairly close to the index.
- At the far right is a concentrated fund, with a few big bets and a large gap from the index.
- As we move right, three things grow together: the fee, the tracking risk, and the hope of beating the market.

3 The case for passive

- Efficient markets: prices already hold the news
- Low fees: the index fund costs very little
- Low turnover: few trades, few taxable gains
- Before costs, active managers together earn the market

IN THE LESSON

- Why would a trustee choose the passive end?
- There are four reasons.
- First, if markets are efficient, prices already hold the news, so picking shares adds little.
- Second, fees are tiny.
- Third, an index fund trades rarely, so it pays low trading costs and realises few taxable gains.
- Fourth, and most important, there is some arithmetic.
- Everyone together owns the market.
- So before costs, all investors together earn exactly the market return.
- Active managers charge more than index funds, and those costs come straight out of what clients keep.
- So the average active manager must lag the index once fees are taken off.
- That is the passive case in one sentence.

4 Example 1: the arithmetic of active management

Market return 8%; index fee 0.05%; active fee 0.90%

Index fund, after fee	8.00 − 0.05	**7.95%**
Average active, after fee	8.00 − 0.90	**7.10%**
Gap per year	7.95 − 7.10	**0.85 points**
Skill needed just to match	the fee gap	**0.85%**

IN THE LESSON

- Let us see the arithmetic with numbers.
- Say the market returns eight per cent in a year.
- An index fund charging point zero five per cent gives investors seven point nine five.
- Before costs, all the active managers together also earn the market, eight per cent.
- Now take off their average fee, point nine zero per cent, and they keep seven point one zero.
- The gap is point eight five per cent, every year.
- That sounds small, but gaps compound for a long, patient investor.
- So the real question is whether a manager's skill can be big enough to pay for that gap.

5 The middle, and when active pays

- Smart beta: rules-based tilts to value, momentum and so on
- Costs less than active, more than an index fund
- Active pays if skill survives fees, or markets are less efficient
- Or needs an index cannot meet, like ESG rules

IN THE LESSON

- So when does a client move away from passive?
- In the middle sits smart beta, also called factor based investing.
- A written rule tilts the portfolio toward a factor that has been rewarded, such as value or momentum.
- Because the rule is mechanical, the fee is lower than for a full active fund, though higher than for an index fund.
- Full active management makes sense in three situations.
- The client believes the manager has skill that survives the fee.
- Or the market is one where prices are less efficient, so skill has more room to work.
- Or the client has needs that no index can meet, such as an E S G rule or a tax constraint.
- Each time the test is the same: expected alpha, set against the fee and the tracking risk.

6 What clients pay for active risk

Chart: Fee (% a year) vs Tracking error (% a year)

- ● Index fund
- ● Smart beta
- Active ●
- ● Closet indexer
- Fair price for risk

IN THE LESSON

- Here is a picture of what clients pay for active risk.
- The horizontal axis is tracking error, how far the fund's returns wander from the index, in per cent a year.
- The vertical axis is the fee, in per cent.
- The grey line is a rough fair price: the more tracking risk you take, the more it costs to run.
- The index fund sits at the bottom left, with almost no tracking error and a tiny fee.
- Smart beta sits close to the line.
- The active fund is further up and further right, with a bigger fee and a bigger gap from the index.
- Now look at the closet indexer.
- Its tracking error is low, yet its fee is close to an active fund, far above the line.

7 Example 2: the closet indexer

Fee 0.80%; 20% of holdings differ from index; index fee 0.05%

Index-like part, 80% of fund	80% × 0.05%	**0.04%**
Fee left for the active part	0.80 − 0.04	**0.76%**
Fee per unit of active	0.76 ÷ 0.20	**3.80%**
Alpha to break even	0.20 × (3.80 − 0.05)	**0.75%**

IN THE LESSON

- Now the trap.
- Many people think low tracking error means passive.
- It does not.
- Passive means a rule, a low fee and no attempt to beat the market.
- A fund can hug the index and still charge for skill.
- That is a closet indexer.
- Larch Hollow holds one.
- It charges point eight per cent, yet only twenty per cent of its holdings differ from the index.
- The other eighty per cent could be bought for point zero five.
- Price that part at index cost, and it is worth point zero four.
- The fee left over is point seven six, but it is earned on only a fifth of the money, so each unit of real active exposure costs three point eight per cent.
- To break even, the fund must beat the index by point seven five per cent a year.

8 Example 3: Mira's recommendation

Net alpha = alpha − (fee − 0.05%). All figures are estimates

Index fund, fee 0.05%	0 − 0	**0.00%**
Smart beta, fee 0.35%	0.60 − 0.30	**0.30%**
Active, fee 0.90%	1.50 − 0.85	**0.65%**
Closet fund, fee 0.80%	0.20 − 0.75	**−0.55%**
Net per unit of tracking error	0.30÷2.0 vs 0.65÷5.0	**0.15 v 0.13**

IN THE LESSON

- Now Mira Okonkwo must recommend.
- She estimates what each choice might add after fees.
- For each she takes the expected alpha, the amount it may beat the index by before fees, and subtracts the extra fee over the index fund.
- The index fund adds nothing.
- Smart beta, with alpha of point six and an extra fee of point three, nets point three.
- Full active, with alpha of one point five and an extra fee of point eight five, nets point six five.
- The closet fund, with alpha of point two and an extra fee of point seven five, loses point five five.
- Risk matters too.
- Dividing by tracking error of two and five, net alpha per unit is point one five for smart beta and point one three for active.
- She recommends a smart beta core, with a small active slice only if the trustees trust the alpha forecasts, which could be wrong.

9 A story: the wrong ruler

- A swimmer timed against a marathon runner
- The benchmark is the ruler for the manager's skill
- A wrong ruler mixes up style with skill
- Start from what the manager actually buys

IN THE LESSON

- Imagine a swimmer is timed over a short sprint, and her time is then compared with a marathon runner's time.
- The comparison is silly, because the two are not running the same race.
- A benchmark is the ruler used to judge a manager.
- Larch Hollow has hired a manager who buys small, cheap companies.
- If the trustees measure that manager against an index of giant firms, the answer will tell them about the difference between small and large companies, not about the manager.
- So Mira Okonkwo starts with the manager's universe: the sizes, styles, regions and sectors that the manager actually buys.
- Only then does she look at how candidate indexes are built.

10 What makes a good benchmark

Mira's checklist for any equity benchmark

Quality	What it means
Matches the mandate	Same universe
Specified in advance	Known at start
Rules-based, transparent	Rebuildable
Investable, measurable	Buyable, priced

IN THE LESSON

- A good benchmark has a handful of qualities, and Mira Okonkwo checks each one.
- It matches the mandate, meaning the same universe of size, style and region that the manager buys.
- It is specified in advance, so the manager knows the ruler before the race, and nobody picks it afterwards to flatter the results.
- It is rules based and transparent, so anyone can rebuild it from published rules.
- And it is investable and measurable: the shares can really be bought in the weights shown, at a reasonable cost, and the index is priced often enough to track.
- Investability is the easiest to forget.
- An index nobody can trade in size is a nice picture, not a fair target.

11 How the index is weighted

Weighting method and the exposure it creates

Weighting	Exposure it creates
Market cap or float	Big firms
Price weighted	High-priced shares
Equal weighted	Smaller firms
Fundamental	Cheaper shares

IN THE LESSON

- Next, how the index is built matters, because construction creates exposures.
- Market capitalisation weighting gives each firm a weight in proportion to its value.
- Float adjusted weighting counts only the shares that the public can actually buy.
- These indexes are cheap to follow because winners grow by themselves, so there is little trading.
- Price weighting weights each share by its price, which gives high priced shares more say whatever the size of the firm.
- Equal weighting gives every firm the same weight, which leans toward smaller firms and needs a lot of trading to restore equal weights.
- Fundamental weighting uses measures such as sales or earnings, which tends to lean toward cheaper shares.
- Also check how often the index changes its members, because every change is a cost to someone copying it.

12 Concentration in a cap-weighted index

Weight in index (%)

A: 500	**50%**
B: 300	**30%**
C: 100	**10%**
D: 60	**6%**
E: 40	**4%**

Equal weighting would give 20% each

IN THE LESSON

- Concentration deserves its own picture.
- Take a tiny market of five firms, with market values of five hundred, three hundred, one hundred, sixty and forty.
- The vertical axis is each firm's weight in a market capitalisation weighted index.
- Firm A is half the index, fifty per cent.
- Firm B is thirty per cent.
- Together the top two firms hold most of the index, and the other three share what is left.
- An equal weighted index would give every firm twenty per cent.
- A manager who is measured against this index and who does not hold Firm A at all is taking a huge active bet, even though it is only one missing holding.
- So check concentration.
- If a few names dominate the benchmark, the benchmark itself is a bet.

13 Example 4: style makes a manager look skilled

Small-cap value manager returned 11.0% last year

Against the large-cap index	11.0 − 7.5	**+3.5%**
Against small-cap value index	11.0 − 12.5	**−1.5%**
Swing from the ruler alone	3.5 − (−1.5)	**5.0 points**
Verdict	wrong ruler	**Use small value**

IN THE LESSON

- Now to see how a wrong benchmark misleads.
- Last year the small cap value manager at Larch Hollow earned eleven per cent.
- The trustees compare it with their large company index, which returned seven point five.
- Against that, the manager seems to have added three point five points.
- But the right index is a small cap value index, built by published rules and open to investors, and it returned twelve point five.
- Against that ruler the manager trailed by one and a half points.
- The swing from the choice of ruler alone is five points.
- Nothing about the manager changed.
- Small value firms simply beat large firms last year.
- In another year the story could flip, and the manager would look poor for the very same reason.

14 Example 5: choosing the benchmark

Which index holds what the manager actually buys?

Index A: large-cap	manager holdings found	**4%**
Index B: small-cap value	manager holdings found	**62%**
Index C: broad blend	manager holdings found	**18%**
Index B: yearly turnover	cost of copying it	**14%**
Verdict	passes every test	**Adopt B**

IN THE LESSON

- Mira Okonkwo now checks three candidate indexes against what the manager really holds.
- The first question is how much of the manager's portfolio appears in each index.
- In the broad large company index it is four per cent.
- In the small cap value index it is sixty two per cent.
- In a broad blend, eighteen per cent.
- The small cap value index is the clear match.
- Next she checks it passes the other tests.
- It is rules based, specified in advance and investable, and it turns over fourteen per cent of its holdings a year, which is a modest cost to copy.
- Her recommendation is to adopt it, and keep the large company index only as a side reference.
- She also asks the provider for its trading rules, since small shares can be thinly traded.

15 Mistakes to avoid so far

- Calling low tracking error passive
- Never pricing the active part of a fund
- Judging a manager against the wrong style index
- Choosing an index nobody could actually buy
- Ignoring concentration in a cap-weighted index

IN THE LESSON

- Let us gather the traps from these two topics.
- One: treating low tracking error as proof that a fund is passive, when a closet indexer charges active fees for index like holdings.
- Two: never working out what the active part of such a fund really costs.
- Three: judging a manager against the wrong style index, so that style looks like skill.
- Four: choosing an index nobody could actually buy, however neat its numbers look.
- Five: ignoring concentration in a market capitalisation weighted index, where a few names can be most of the ruler.

16 A story: the keel

- A keel steadies a boat in rough water
- Bonds diversify shares: correlation is usually low
- They pay predictable cash flows for spending
- Linked bonds hedge inflation; bonds can match liabilities

IN THE LESSON

- A sailing boat has a heavy keel under the water.
- It does not make the boat faster.
- It stops the boat tipping over in rough weather.
- Bonds do a similar job in a portfolio, and Larch Hollow holds them for four reasons.
- First, they diversify shares, because the correlation of bonds with shares is usually low, so they often hold steady when shares fall.
- Second, they pay predictable cash flows, which helps a fund that must pay pensions every month.
- Third, inflation linked bonds can hedge inflation, since their payments rise with prices.
- Fourth, bonds can be chosen to match liabilities, the pensions the fund has promised to pay.
- These four reasons matter, because they decide what kind of bond mandate fits.

17 Four reasons to hold bonds

Why Larch Hollow holds bonds

Reason	What the bond gives
Diversify shares	Low correlation
Spending needs	Steady coupons
Inflation	Linked bonds
Liabilities	Matched cash flows

IN THE LESSON

- Here are the four reasons, with what the bond gives in each.
- For diversification, the bond gives a low correlation with shares.
- For spending needs, steady coupons that arrive on known dates.
- For inflation, linked bonds whose payments rise with a price index.
- For liabilities, cash flows and an interest rate sensitivity chosen to match the promises.
- Which reason matters most depends on the client.
- A young fund with no payments due for decades might hold bonds mainly for diversification.
- Larch Hollow, with pensions already in payment, cares most about the last two.
- Keep this in mind, because the reason a client holds bonds decides how the mandate is written.

18 Example 6: diversification in numbers

Shares 60%, volatility 16%; bonds 40%, volatility 6%

Shares only	volatility	**16.00%**
Mix, correlation 0.2	√(92.16+5.76+9.22)	**10.35%**
Mix, correlation 0.8	√(92.16+5.76+36.86)	**11.61%**
Cost of higher correlation	11.61 − 10.35	**1.26 points**

IN THE LESSON

- Let us see diversification in numbers, using the two asset volatility formula you know from earlier levels.
- Larch Hollow holds sixty per cent shares with volatility of sixteen per cent, and forty per cent bonds with volatility of six.
- Shares alone have volatility of sixteen.
- Suppose the correlation between shares and bonds is point two.
- The variance has a part from shares, ninety two point one six, a part from bonds, five point seven six, and a mixing term of nine point two two.
- Add them and take the square root: ten point three five per cent.
- Now suppose inflation worries push the correlation to point eight.
- The mixing term grows to thirty six point eight six, and volatility rises to eleven point six one.
- The trap is to assume bonds always diversify.
- The cushion thins exactly when the correlation rises, as in an inflation driven sell off.

19 Two families of bond mandate

Two families, and the aim of each

Mandate	Aim
Liability-based	Meet known bills
Cash flow matching	Coupons pay bills
Immunisation	Match duration
Total return	Beat a benchmark

IN THE LESSON

- Now, how are bond mandates sorted?
- There are two broad families.
- Liability based mandates exist to meet known obligations.
- Within them, cash flow matching builds a bond portfolio whose coupons and maturities pay each bill as it falls due.
- Immunisation is looser: it matches the present value and the duration of the assets to the liabilities, so that a change in rates moves both by the same amount.
- Total return mandates are different.
- They target a benchmark, usually a bond index, and try to match or beat it.
- Which family fits depends on the client's main risk: falling short of liabilities, or underperforming an index.
- Larch Hollow pays pensions, so it needs to think hard about the first family.

20 Total return: from indexing to active

- Pure indexing
- Enhanced indexing
- Active

IN THE LESSON

- Total return mandates range along a line, just as equity ones do.
- At the left is pure indexing.
- The manager copies the bond index as closely as possible, with the lowest fee and almost no deviation.
- In the middle is enhanced indexing.
- The portfolio stays close to the index, with small deviations in risk factors, such as a little more duration or a little more credit, hoping to earn a small extra return.
- At the right is active management, with larger bets on duration, on the shape of the yield curve, on sectors, and on credit quality.
- Moving right, the hoped for extra return rises, but so do the tracking error and the fee.
- As with equities, the client must decide whether the manager's skill is worth that extra cost.

21 Example 7: a liability-based case

Liabilities 240m, duration 10; bonds 200m, duration 5.35; yields −1%

Liabilities rise	240m × 10 × 1%	**24.0m**
Bonds rise	200m × 5.35 × 1%	**10.7m**
Funding gap widens	24.0 − 10.7	**13.3m**
Duration to move in step	240 × 10 ÷ 200	**12.0**

IN THE LESSON

- Here is why the mandate matters.
- Larch Hollow's promised pensions have a present value of two hundred and forty million and a duration of ten.
- Its bond portfolio is two hundred million, with a duration of five point three five.
- Suppose all yields, including the rate that values the pensions, fall by one per cent.
- The liabilities rise by two hundred and forty million times ten times one per cent, which is twenty four million.
- The bonds rise by only ten point seven million.
- The funding gap widens by thirteen point three million, even though the bond manager did exactly what the benchmark asked.
- To move in step, the bonds would need a duration of twelve.
- So the main risk is a shortfall, not lagging an index.
- Mira Okonkwo should propose a liability based mandate.

22 Choosing the mandate

If the client ... then the mandate

If the client...	Choose
Must pay fixed bills	Liability-based
Is judged on an index	Total return
Wants cheap exposure	Indexing
Trusts credit skill	Active

IN THE LESSON

- Here is a quick guide to the choice, as a set of if then statements.
- If the client must pay fixed bills, a liability based mandate fits.
- If the client is judged against a market index, a total return mandate fits.
- If the client wants cheap exposure to the bond market and has no view, indexing is the answer within total return.
- If the client trusts a manager's skill in credit or in duration, active management is the answer within total return.
- Notice that the question is always the same: is the client's main risk falling short of what it owes, or falling behind a benchmark?

23 Portfolio duration and price change

Portfolio D = Σ (w × D)
%ΔP ≈ −D × Δy + ½ × C × (Δy)²

Weight	Share of market value
Duration	Sensitivity to yield shifts
Convexity	Curvature of price against yield
Yield change	Parallel shift, as a decimal

IN THE LESSON

- Two formulas now.
- The first gives a bond portfolio's duration.
- It is the market value weighted average of the duration of each holding: multiply each weight by its duration and add them up.
- This measures sensitivity to a parallel shift in yields, meaning every yield moves by the same amount.
- The second formula estimates the percentage price change.
- The duration term is minus duration times the change in yield.
- The convexity term adds half the convexity times the yield change squared.
- Duration gives a straight line estimate, and convexity corrects for the curve.
- Because the yield change is squared, the convexity term is always positive, and it matters more as the move gets larger.
- Use effective duration when the cash flows themselves change with rates.

24 Example 8: Larch Hollow's portfolio duration

Bond portfolio 200m: government 120m, corporate 50m, high yield 30m

Government 60%, duration 5.0	0.60 × 5.0	**3.00**
Corporate 25%, duration 7.0	0.25 × 7.0	**1.75**
High yield 15%, duration 4.0	0.15 × 4.0	**0.60**
Portfolio duration	3.00 + 1.75 + 0.60	**5.35**

IN THE LESSON

- Let us work out the duration of Larch Hollow's current bond portfolio.
- It holds two hundred million: one hundred and twenty million of government bonds, fifty million of corporate bonds and thirty million of high yield.
- The weights are sixty, twenty five and fifteen per cent.
- The durations are five, seven and four.
- Multiply each weight by its duration: three point zero zero, one point seven five and point six zero.
- Add them to get five point three five.
- Notice the weights are market values, not counts of bonds.
- So a one per cent rise in every yield would cut the portfolio's value by about five point three five per cent, before any help from convexity.

25 Why duration is a straight line on a curve

Chart: Price of the portfolio vs Yield

- True price: curved
- Duration: straight
- Today

IN THE LESSON

- Here is the picture behind convexity.
- The horizontal axis is the yield.
- The vertical axis is the price of the portfolio.
- The curved line is the true price: as yields rise, the price falls, but the fall slows as we move right, so the line bends.
- The vertical grey line marks today's yield.
- The straight line touching the curve there is the duration estimate, which uses only the slope.
- Look at the gap.
- On both sides of today the curve sits above the straight line.
- When yields fall, the true price rises by more than duration says.
- When yields rise, the true price falls by less.
- That extra bit is convexity, and it is good for the holder.

26 Example 9: estimating a price change

Duration 5.35, convexity 48, portfolio 200m

Yields up 0.75%: duration	−5.35 × 0.0075	**−4.01%**
Convexity effect	½ × 48 × 0.0075²	**+0.135%**
Estimated change	−4.0125 + 0.135	**−3.88%**
Money, on 200m	200 × 3.88%	**−7.8m**
Yields down 2%: both effects	10.70 + 0.96	**+11.66%**

IN THE LESSON

- Now use the formula.
- Suppose all yields rise by point seven five per cent.
- The duration effect is minus five point three five times point zero zero seven five, which is minus four point zero one per cent.
- Convexity, say forty eight for this portfolio, adds half times forty eight times point zero zero seven five squared, plus point one three five.
- The estimated change is about minus three point eight eight, which is seven point eight million on two hundred million.
- Now a bigger move: all yields fall by two per cent.
- Duration gives plus ten point seven zero, convexity adds point nine six, and the total is eleven point six six.
- Convexity added little to the small move and much more to the big one.
- It helps in both directions, adding to gains and softening losses.

27 Other measures of bond risk

Which measure for which risk

Measure	Use it for
Effective duration	Embedded options
Spread duration	Credit spreads
Key rate duration	Curve shifts
Convexity	Large moves

IN THE LESSON

- Parallel duration is not the only tool.
- Effective duration is used when cash flows depend on rates, as with callable bonds, where the issuer may repay early, and mortgage backed securities, where homeowners may prepay.
- It measures the price change when yields move up and down, allowing the cash flows to change.
- Applying ordinary modified duration to such bonds misstates their rate sensitivity.
- Spread duration measures sensitivity to a change in credit spreads, which matters for corporate and high yield holdings.
- Key rate durations show exposure to a shift at one maturity, such as the ten year, so they reveal curve risk that a single duration number hides.
- And convexity measures the curvature, as we saw, which matters for large moves.

28 Example 10: a credit scare

Spreads widen 0.50%; government yields do not move

Credit holdings	50m + 30m	**80m**
Spread duration	given	**6.0**
Loss on credit holdings	6.0 × 0.50%	**−3.0%**
Loss in money	80m × 3.0%	**−2.4m**
Share of the 200m portfolio	2.4 ÷ 200	**−1.2%**

IN THE LESSON

- Now suppose credit worries hit Larch Hollow.
- The corporate and high yield holdings together make eighty million, and their spread duration is six.
- Credit spreads widen by point five zero per cent, while government yields do not move at all.
- A single duration number for yield shifts would say nothing happens, because yields are unchanged.
- But spread duration says the credit holdings lose six times point five per cent, which is three per cent.
- That is two point four million on eighty million.
- On the whole two hundred million portfolio it is one point two per cent.
- The government bonds are untouched.
- So the portfolio carries two kinds of risk, interest rate risk and credit risk, and one number cannot capture both.

29 Example 11: where the curve risk sits

Key rate durations of the 200m portfolio

Two-year key rate duration		**0.90**
Five-year key rate duration		**1.80**
Ten-year key rate duration		**2.65**
Sum: portfolio duration	0.90 + 1.80 + 2.65	**5.35**
Ten-year yield up 0.50%	2.65 × 0.50%	**−1.3%**

IN THE LESSON

- Key rate durations split the portfolio's duration by maturity.
- For Larch Hollow, the two year key rate duration is point nine zero, the five year is one point eight zero, and the ten year is two point six five.
- They add up to five point three five, the same as the portfolio duration, so nothing is lost.
- Now suppose only the ten year yield rises by point five zero per cent, while the others stay put.
- The loss is two point six five times point five per cent, about one point three per cent.
- A parallel shift model would have missed the fact that the exposure is concentrated in long maturities.
- That tells Mira Okonkwo where the curve risk sits, and if the trustees dislike it she can shorten the long end.

30 How bonds move with shares

Correlation with shares

Government	**0.1**
Investment grade	**0.4**
High yield	**0.7**

Made-up round numbers, to show the idea

IN THE LESSON

- Finally, how bonds move with other assets.
- Here are illustrative correlations with shares for three kinds of bond.
- The vertical axis is the correlation with shares.
- Government bonds are the low bar, point one, and in some periods the figure has been negative.
- Investment grade corporate bonds are higher, at point four, because they carry some credit risk, which is tied to the fortunes of companies.
- High yield bonds are highest, at point seven, because a company with weak credit looks a lot like a company whose shares are cheap.
- So high yield behaves like equity.
- These bars are made up round numbers to show the idea, not data.
- If Larch Hollow wants bonds to cushion shares, government bonds do the work, and high yield mostly does not.

31 Example 12: which bonds cushion a fall

Portfolio: 60% shares, 40% bonds

Shares −20%, government +5%	0.6×(−20) + 0.4×5	**−10.0%**
Shares −20%, high yield −12%	0.6×(−20) + 0.4×(−12)	**−16.8%**
Inflation: shares −15%, gov −8%	0.6×(−15) + 0.4×(−8)	**−12.2%**
Lesson	correlation changes with regime	**Check regime**

IN THE LESSON

- Let us put this to work.
- In a sixty forty portfolio, suppose shares fall twenty per cent.
- If the bonds are government bonds that rise five per cent, the portfolio loses point six times twenty, less point four times five, which is ten per cent.
- If instead the bonds are high yield and fall twelve per cent, the portfolio loses sixteen point eight.
- Same shock, same weights, very different result.
- Now a different regime.
- Inflation surprises everyone, shares fall fifteen and government bonds fall eight.
- The portfolio loses twelve point two, and the bond cushion has gone.
- Correlation is not a constant.
- It is low or negative when growth worries dominate, and positive when inflation drives rates, so always ask which regime you are in.

32 Recap: the lesson in five lines

- Passive to active: alpha against fees and risk
- Benchmark: matches universe, rules-based, investable
- Bonds: diversify, cash flows, inflation, liabilities
- Mandates: liability-based or total return
- Duration, convexity, spread and key rate; correlation shifts

IN THE LESSON

- Let us pull the lesson together.
- First, the range from passive to highly active is a choice made by weighing expected alpha against fees and tracking risk, and low tracking error does not make a fund passive.
- Second, a benchmark must match the manager's universe, and be rules based, specified in advance and investable, with weighting and concentration checked.
- Third, bonds diversify, pay predictable cash flows, hedge inflation when linked, and match liabilities.
- Fourth, mandates are either liability based or total return, and the client's main risk decides.
- Fifth, portfolio duration, convexity, spread duration and key rate duration measure bond risk, and correlation with shares changes with the regime.

33 Try three quick questions

1. Fee 1.00%, 25% active, index fee 0.05%. Break-even alpha?
   Answer: 1.00 − 0.05 = 0.95% a year on the whole fund.
2. Half duration 3, half duration 9. Duration? Yields up 0.5%?
   Answer: Duration 6.0; −6.0 × 0.5% = −3.0%.
3. Liabilities 100m, duration 8. Bonds 80m. Duration needed?
   Answer: 100 × 8 ÷ 80 = 10.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- A fund charges one per cent, only a quarter of its holdings differ from the index, and the index fund fee is point zero five.
- What alpha on the whole fund does it need to break even?
- The extra fee is one less point zero five, so the answer is point nine five per cent a year.
- Question two.
- Half a portfolio has duration three and half has duration nine.
- What is the portfolio duration, and what happens if yields rise by half a per cent?
- The average is six, and six times point five is a loss of three per cent.
- Question three.
- Liabilities are one hundred million with duration eight, and the bonds are eighty million.
- What bond duration moves assets in step?
- One hundred times eight over eighty gives ten, which is the target for the bonds.